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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/670,157	09/26/2000	Rajesh Sundaram	205514	4843

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EXAMINER	
STRANGE, AARON N	

ART UNIT	PAPER NUMBER
2153	

DATE MAILED: 09/17/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/670,157	SUNDARAM ET AL.	
	Examiner	Art Unit	
	Aaron Strange	2153	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *28 June 2004*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-5,7 and 9-24* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5,7,9-12,14 and 16-24* is/are rejected.

7)☒ Claim(s) *13 and 15* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *26 September 2000* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *2182004*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments with respect to claims 1-12, 14, and 16-22 have been considered but are moot in view of the new ground(s) of rejection.

2. Applicant's arguments, see Page 8, Line 16 to Page 9, Line 9, filed 6/24/2004, with respect to claims 13 and 15 have been fully considered and are persuasive. The rejection of claims 13 and 15 has been withdrawn.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-5,7,9-11 and 16-24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Graham et al. (Nonintrusive and Accurate Measurement of Unidirectional Delay and Delay Variation on the Internet in view of RFC 2391.

5. With regard to claim 1, Graham et al. (Graham, hereafter) discloses a method for calculating jitter of a packet flow comprising: accessing data collected on the sending computer (information is sent to analysis site)(Page 2, Lines 12-13), said data comprising identifiers of a plurality of packets sent by the program along with timestamps representing the times of transmission of the sent packets

(Page 3, Lines 7-9); accessing data collected on the receiving computer (information is sent to analysis site)(Page 2, Lines 12-13), said data comprising identifiers of a plurality of packets received from the network along with timestamps representing the times of reception of the received packets (Page 3, Lines 7-9); associating, through the use of the sent and received packet identifiers, at least some of the sent packets with the received packets (Page 3, Lines 35-38) ; and calculating jitter as the variation in the difference between the reception and transmission timestamps of associated packets (Page 4, Line 41 to Page 5, Line 5). However, Graham fails to disclose comparing a field uniquely identifying the packet flow in the sent and received packet identifiers and comparing an IP ID assigned to the packet in the sent and received packet identifiers.

RFC 2391 discloses that a TCP/UDP session is uniquely identified by the tuple of source/destination IP address and source/destination port identifiers (Page 4, Lines 4-6). Since TCP/UDP sessions require port identifiers to be uniquely identified, it would be advantageous to compare these parameters in addition to the source/destination IP address for TCP/UDP sessions. This would have allowed the system disclosed by Graham to calculate jitter for individual TCP/UDP packet flows between applications in the event that multiple packet flows between the same source/destination pair are in progress simultaneously.

Graham acknowledges that problems could occur if a significant number of packets with the same payload CRC occurred on the network within the delay time (Page 3, Line 43 to Page 4, Line 5). The standard IP identifier located in the

header of an IP packet is a 16-bit uniquely assigned number given to the packet by the sending station. The sending station consecutively numbers each packet as it is sent. By using a sliding window protocol, the receiving station can essentially eliminate all packets having duplicate identifiers. This ensures that all received packets can be uniquely matched to a sent packet. An additional benefit of using the IP identifier to identify packets is the ability to determine if packets arrive out of order. Since the packets are sequentially numbered as they are sent, they should be received sequentially.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to uniquely identify the packet flow by comparing the sender/receiver ports in addition to the addresses and protocol identifier and use the IP identifier as the means for uniquely identifying packets. This would have allowed data to be collected for a specific packet flow in the event that multiple flows between the same source/destination pair were in progress simultaneously and ensures that duplicate identifiers can be differentiated by using a sliding window as well as allowing the receiving station to easily determine when packets arrive out of order.

6. With regard to claim 2, Graham further discloses that associating and calculating overlap in time with accessing data collected on the sending and receiving computers (Page 3, Lines 21-23).

7. With regard to claims 3 and 4, while the system disclosed by Graham in view of RFC 2391 shows substantial features of the claimed invention (discussed above), it fails to disclose that accessing the collected data comprises sending said data to the receiving computer or sending said data to the sending computer.

Graham discloses that the monitoring stations send information to a single analysis site (Page 2, Lines 12-13), but remain silent regarding any limitations of the analysis site. It is clear that the location of the analysis site is not critical to the functionality of the system. The analysis site simply correlates the collected data and calculates delay and jitter measurements (Page 3, Lines 35-38). It would be advantageous to allow the either the sending computer or the receiving computer to act as the analysis site and receive the data since it would eliminate the need for a dedicated computer used for associating and calculating jitter for the data.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to send the collected data to either the sending computer or the receiving computer. This eliminates the need for an additional station dedicated to associating and calculating jitter for the data, reducing costs for the measurement system.

8. With regard to claim 5, Graham further discloses that accessing data collected on the sending and receiving computers comprises sending said data

to a computer other than the sending and receiving computers (monitoring stations send information to a single analysis site) (Page 2, Lines 12-13).

9. With regard to claim 7, as discussed regarding claim 1, Graham in view of RFC 2391 discloses that comparing a field identifying the packet flow comprises comparing a sender IP address, a sender port, a receiver IP address, a receiver port (session tuple), and a protocol identifier (TCP or UDP) (Page 4, Lines 4-6).

10. With regard to claim 9, Graham further disclose that associating at least some of the sent packets with received packets comprises noting as lost in transmission sent packets which are not associated with received packets (Page 4, Lines 6-8).

11. With regard to claim 10, while the system method disclosed by Graham in view of RFC 2391 shows substantial features of the claimed invention (discussed above), it fails to disclose that associating at least some of the sent packets with received packets comprises using the received packet identifiers to reorder the data collected on the receiving computer into the order in which the received packets were sent.

However, since jitter is calculated as the difference between the reception and transmission timestamps of associated packets, it would be advantageous to reorder the packets into the order in which they were sent. The sending computer would already have the packets in sequential order, so associating them would

be simpler if the received packets were also placed in sequential order. By having both sets of packets in order, the jitter calculation could be quickly performed sequentially by traveling down the data set and calculating the delay between each matched pair of successive packets. By using the IP identifier discussed regarding claim 8, this reordering would be simple and relatively fast.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to reorder the data collected on the receiving computer into the order in which the received packets were sent. This would allow the calculation of jitter to be much faster since the associated receive timestamps would be easier to find and would not require searching the entire list. This could save a significant amount of time for large data sets.

12. With regard to claim 11, as discussed regarding claim 10, reordering comprises comparing a rollover component of the received packet identifiers (IP identifier rolls over).

13. With regard to claim 16, Graham further discloses that calculating jitter comprises correcting for jumps (offset) in the clocks on the sending and receiving computers (Page 3, Lines 15-18).

14. With regard to claim 17, Graham further discloses that calculating jitter comprises correcting for skew between the clocks (drift) on the sending and receiving computers (Page 3, Lines 15-18).

15. With regard to claim 18, Graham further discloses a computer readable medium containing instructions for performing the method of claim 1. Since the method of claim 1 is executed on computers (Page 2, Lines 12-13), instructions for performing said method must be located on a computer readable medium or the computers would not be able to read the instructions to perform the method.

16. With regard to claim 19, Graham disclose a computer readable medium having a data structure comprising: a third data field containing data representing a time of transmission of the packet (Page 3, Lines 7-9); and a fourth data field containing data representing a time of reception of the packet (each station records timestamp)(Page 3, Lines 7-9 and Lines 35-38). Since the method of claim 1 is executed on computers (Page 2, Lines 12-13), instructions for performing said method must be located on a computer readable medium or the computers would not be able to read the instructions to perform the method. However, Graham fails to disclose a first data field containing data representing an identity of a packet flow or a second data field containing data representing an identity of a packet transmitted in the packet flow since the descriptor and CRC disclosed by Graham cannot differentiate between flows of the same protocol between the same endpoints or between packets with the same CRC.

RFC 2391 discloses that a TCP/UDP session is uniquely identified by the tuple of source/destination IP address and source/destination port identifiers (Page 4, Lines 4-6). Since TCP/UDP sessions require port identifiers to be

uniquely identified, it would be advantageous to compare these parameters in addition to the source/destination IP address for TCP/UDP sessions. This would have allowed the system disclosed by Graham to calculate jitter for individual TCP/UDP packet flows between applications in the event that multiple packet flows between the same source/destination pair are in progress simultaneously.

Graham acknowledges that problems could occur if a significant number of packets with the same payload CRC occurred on the network within the delay time (Page 3, Line 43 to Page 4, Line 5). The standard IP identifier located in the header of an IP packet is a 16-bit uniquely assigned number given to the packet by the sending station. The sending station consecutively numbers each packet as it is sent. By using a sliding window protocol, the receiving station can essentially eliminate all packets having duplicate identifiers. This ensures that all received packets can be uniquely matched to a sent packet. An additional benefit of using the IP identifier to identify packets is the ability to determine if packets arrive out of order. Since the packets are sequentially numbered as they are sent, they should be received sequentially.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to uniquely identify the packet flow by comparing the sender/receiver ports in addition to the addresses and protocol identifier and use the IP identifier as the means for uniquely identifying packets. This would have allowed data to be collected for a specific packet flow in the event that multiple flows between the same source/destination pair were in progress simultaneously and ensures that duplicate identifiers can be

differentiated by using a sliding window as well as allowing the receiving station to easily determine when packets arrive out of order.

17. With regard to claim 20, as discussed regarding claim 19, the system disclosed by Graham in view of RFC 2391 discloses that the second field comprises a fifth field containing data representing an IP ID assigned to the packet (Standard IP identifier in IP header).

18. With regard to claim 21, as discussed regarding claim 19, Graham further discloses that this first field comprises: a fifth field containing data representing a sender IP address of the packet flow; a sixth field containing data representing a sender port of the packet flow; a seventh field containing data representing a receiver IP address of the packet flow; an eighth field containing data representing a receiver port of the packet flow (session tuple); and a ninth field containing data representing a protocol identifier of the packet flow (TCP or UDP) (Page 4, Lines 4-6).

19. With regard to claim 22, while the system disclosed by Graham in view of RFC 2391 shows substantial features of the claimed invention, it fails to disclose that the data structures are sorted into the order of the times of transmission.

However, since jitter is calculated as the difference between the reception and transmission timestamps of associated packets, it would be advantageous to reorder the packets into the order in which they were sent. The sending computer

would already have the packets in sequential order, so associating them would be simpler if the received packets were also placed in sequential order. By having both sets of packets in order, the jitter calculation could be quickly performed sequentially by traveling down the data set and calculating the delay between each matched pair of successive packets. By using the IP identifier discussed regarding claim 19, this reordering would be simple and relatively fast.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to reorder the data collected on the receiving computer into the order in which the received packets were sent. This would allow the calculation of jitter to be much faster since the associated receive timestamps would be easier to find and would not require searching the entire list. This could save a significant amount of time for large data sets.

20. With regard to claim 23, Graham further discloses normalizing send timestamps and receive timestamps to account for a clock skew effect (drift) (Drift and offset are calculated and corrected) (Page 3, Lines 15-18 and 33-35).

21. With regard to claim 24, Graham further discloses analyzing the timestamps to determine whether a timer jump (offset) has occurred (Drift and offset are calculated and corrected) (Page 3, Lines 15-18 and 33-35).

22. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Graham et al. (Nonintrusive and Accurate Measurement of Unidirectional Delay

and Delay Variation on the Internet) in view of RFC 2391 in further view of Dickens (US 5,806,063).

23. With regard to claim 12, while the system disclosed by Graham in view of RFC 2391 shows substantial features of the claimed invention (discussed above), it fails to disclose that reordering comprises imposing a window on the range of possible values of the rollover component of the received packet identifiers and reordering only the data the values of whose rollover component are within the window.

Since the data collected has a rollover component (IP identifier), sorting it requires a different method than usual. Due to the existence of the rollover component, 0 is not necessarily the smallest packet identifier since the first packet sent usually does not have 0 as an identifier. Dickens teaches imposing a window on the range of possible values of the rollover component of a 2-digit date and reordering only the data whose rollover component falls within the window. By using a window, special treatment can be given to data within that window. In the system disclosed by Dickens, data on each side of the rollover point is treated differently. Dates after the rollover point are treated as higher than dates prior to the rollover point, disregarding the numerical values. A date in 01 (2001) will be treated as after a date in 99 (1999) despite 99 being larger than 1. This method of sorting around a rollover point would be equally effective in sorting packets based upon their identifiers. Since the sending station sequentially issues identifiers, they are effective as dates for the purpose of sequential ordering of packets.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to impose a window on the range of possible values of the rollover component of the received packet identifiers and reorder only the data the values of whose rollover component are within the window. This allows packets to be properly sorted into sequential order when the rollover component has rolled over, as shown in the system disclosed by Dickens.

24. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Graham et al. (Nonintrusive and Accurate Measurement of Unidirectional Delay and Delay Variation on the Internet) in view of RFC 2391 in further view of Tanenbaum.

25. With regard to claim 14, while the system disclosed by Graham in view of RFC 2391 shows substantial features of the claimed invention (discussed above), it fails to disclose that associating comprises imposing a window on the range of possible values of the rollover of the received packet identifiers and searching for a received packet identifier to match a sent packet identifier only among those data the values of whose rollover component are within the window.

Tanenbaum discloses several variations of sliding window protocols. In all sliding window protocols, a sender in a sliding window protocol maintains a window of packets that have not yet been acknowledged at any one time (Page 203, Line 33 to Page 204 Line 10). If an acknowledgment is not received after a predetermined time period, the sender can detect the missing slot in the window

and will retransmit the original frame. The acknowledgement must be received before advancing the window past the missing slot. This method of detecting whether an acknowledgment is missing or not would work equally well for searching for a received packet identifier to match a sent packet identifier, since the frames have already been sequentially sorted. Once a packet has been matched, there is no value to searching it again since it will not match any more frames. Using a window will limit the size of the area being searched as it advances past the matched bits, speeding up the search process since fewer elements have to be searched to find a match.

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to comprises impose a window on the range of possible values of the rollover of the received packet identifiers and search for a received packet identifier to match a sent packet identifier only among those data the values of whose rollover component are within the window. This would speed up the process of searching for a match since the packets have already been sorted by transmission time, and if a packet is found which was transmitted after the packet being searched for, then the missing packet can be assumed to be lost in transmission.

Allowable Subject Matter

26. Claims 13 and 15 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Conclusion

27. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

28. With regard to claims 19-22, the new grounds of rejection were necessitated by the amendment of claim 19. The term "an identify of" in lines 3 and 4 was interpreted as "an identifier of" for the purpose of applying prior art in the first Office action (Page 4, Par 12, Lines 3-4). This interpretation was in accordance with the "broadest reasonable interpretation consistent with the specification" standard (See MPEP 904.01). The specification referred to a "flow identifier" on Page 22, Lines 24-26 as well as a "packet identifier" 22-23. While the specification states that the flow identifier is unique, this limitation does not appear in the claim. Furthermore, the specification specifically states that the packet identifier is not unique on Page 23, Lines 22-23, making it difficult to interpret identical language in two different ways. Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993). By amending the claim to read "an identity of", and arguing that the cited reference fails to teach an identity because the flow identifier cannot distinguish between flows of the same protocol between the same endpoints, the scope of the claim changed, necessitating a new grounds of rejection.

29. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**.

See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

30. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Aaron Strange whose telephone number is 703-305-8878. The examiner can normally be reached on M-F 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glen Burgess can be reached on 703-305-4792. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

ANS 9/8/2004

FRANTZ B. JEAN
PRIMARY EXAMINER